Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTES FROM PACIFIC COAST OBSERVATORIES.

A Programme of Solar Research.[1]

The following programme of solar research has been prepared for the Solar Observatory:—

I. DIRECT PHOTOGRAPHY.

(*a*) Daily photographs of the Sun on a scale of 6.7 inches (17^{cm}) to the diameter, for comparison with the spectroheliograph plates.

(*b*) Large scale photographs of spots and other regions, for the study of details.

II. PHOTOGRAPHIC STUDIES OF THE SOLAR ATMOSPHERE WITH THE SPECTROHELIOGRAPH.

(*a*) Daily photographs of the Sun with the lines:—

(1) H_1, showing the calcium flocculi at low level.

(2) H_2, showing the calcium flocculi at higher level.

(3) H_2, showing the calcium flocculi at higher level and the prominences (composite photographs, with separate exposures for flocculi and prominences).

(4) $H\delta$, showing the hydrogen flocculi.

(5) Other dark lines, as may prove feasible, showing the flocculi of the corresponding elements.[2]

(*b*) Measurement and discussion of the above photographs, involving:—

(1) Determination of the area of the flocculi and their distribution in heliographic latitude and longitude. These results will give a measure of the relative activity of different elements in various regions of the solar surface; furnish the means of answering certain questions regarding the relationship of flocculi to spots, such as the time of first appear-

[1] Abstract of *Contributions from the Solar Observatory*, No. 3.

[2] λ 4045, showing the iron flocculi, is now used daily.

ance, relative position on the disk, etc.; and serve for comparison with meteorological and magnetic records.

(2) Measurement of the heliocentric position of points in the flocculi that can be identified on several successive photographs, to determine the law of the solar rotation for the corresponding elements.

(3) Determination of the position, area, and brightness of eruptive phenomena, to find whether they are related to other phenomena of flocculi or spots, to possible changes in the absorption of the solar atmosphere, and to auroras and magnetic storms.

(4) Measurement of the area and brightness of the neutral or bright regions near sun-spots, on photographs of the hydrogen flocculi, for comparison with other phenomena, such as the velocity of ascending and descending currents of calcium vapor, the radiation (for given wave-lengths) of the spots and neighboring regions, etc.

(5) Study of the motion of the high-level calcium vapor, especially in flocculi overhanging sun-spots, to determine the direction and velocity of horizontal currents.

(6) Measurement of the position and area of prominences, and study of their relationship to solar and terrestrial phenomena.

(*c*) Special studies with spectroheliographs of suitable dispersion, involving the use of various dark lines (including enhanced lines) and of lines affected in spots; simultaneous photographs of eruptions on the disk in different lines; comparative studies of quiescent and eruptive prominences with the hydrogen and calcium lines, etc.

III. SPECTROSCOPIC INVESTIGATIONS.

(*a*) Daily photographs of the spectra of spots, region $H\alpha$ to $H\beta$, for the determination of intensities and the identification of lines that are widened or otherwise affected.[1]

[1] These photographs may also chance to record such exceptional phenomena as the remarkable disturbance of the reversing layer described in a previous paper (*Astrophysical Journal*, Vol. XVI, 220, 1902).

(*b*) Photographs of the H (or K) line, with high dispersion, on successive sections of the disk, to give the radial velocity of the calcium vapor in the flocculi, chromosphere, and prominences.

(*c*) Measurements with the bolometer of the relative radiation, corresponding to various wave-lengths, of the sun-spots and photosphere, and bolographs of spot spectra.

(*d*) Spectrographic measurements of the solar rotation, to determine the law of rotation with the lines of various elements, and to detect possible changes in the rotation period. (See also II (*b*), 2.)

(*e*) Miscellaneous investigations, as opportunity may offer, of the spectrum of the chromosphere; the pressure in the solar atmosphere, etc.

IV. STUDIES OF THE TOTAL SOLAR RADIATION.

(*a*) Frequent determinations of the total solar radiation, involving measures with the pyrheliometer at various altitudes of the Sun, and simultaneous bolographic records to give the absorption of the Earth's atmosphere.

(*b*) Frequent determinations of the absorption of the solar atmosphere for light of various wave-lengths, to detect any possible changes in absorption that might account for observed changes in the total radiation.

(*c*) Occasional supplementary observations on Mt. San Antonio (24½ miles = 39.4^{km} from Mt. Wilson) at an altitude of 10,100 feet ($3{,}500^{m}$).

(*d*) A comparative study of different types of pyrheliometers.

V. LABORATORY INVESTIGATIONS.

(*a*) A study of the lines affected in sun-spots under various conditions of temperature, pressure, etc.

(*b*) Determinations of the pressure shifts of certain solar lines.

(*c*) Other similar investigations.

With a few exceptions, these investigations are now in progress at the Solar Observatory. Direct photographs of the Sun are taken daily, but large-scale photographs of details have not yet been started. The daily spectroheliograph routine includes H_1, H_2, $H\delta$, and λ 4045 (Fe) photographs of the disk, and H_2 (composite) photographs of the flocculi and prominences, all on a scale of 6.7 inches to the Sun's diameter.

(See *Contributions* No. 7.) Special studies with the spectroheliograph are also in progress. An account of the work on spot spectra and on the motion of the calcium vapor may be found in *Contributions* Nos. 5 and 6. Special apparatus for the spectrographic study of the solar rotation has been nearly completed in our instrument-shop. The study of the solar radiation has so far been confined to the investigations of the Smithsonian expedition (June-November, 1905), but arrangements have been made to continue this work next year. Laboratory researches will be undertaken shortly with instruments which are now being installed.

GEORGE E. HALE.

SOLAR OBSERVATORY.

FIRST CATALOGUE OF SPECTROSCOPIC BINARIES.[1]

The application of the Doppler-Fizeau principle to the study of the stars, by photographic means, has led to the discovery of an entirely new class of stellar systems, known as spectroscopic binaries. This term is in general applied to those stars which are apparently single when viewed through our most powerful telescopes, but which the spectrograph has shown to be accompanied by invisible companions. However, the condition that the companions shall be invisible is too limited, and it is more satisfactory to class with the spectroscopic binaries all stars whose radial velocities have been observed to vary. The discovery of the first spectroscopic binary, *ζ Ursæ Majoris,* was made by Professor PICKERING in 1889. The objective-prism spectrograms of this star showed that it consisted of two components, approximately equal in brightness, in rapid revolution around their center of mass. The second discovery, made by Professor VOGEL from plates secured with a slit spectrograph, related to *Algol* and the massive and relatively very dark companion which partially occults the bright primary, for terrestrial observers, once each revolution. In successive years additions to the list were made by PICKERING, VOGEL, BELOPOLSKY, Miss MAURY, Mrs. FLEMING, and BAILEY, until, in the summer of 1898, thirteen spectroscopic binaries were known. Since that date the number has increased with great rapidity. The systems observed up

[1] Extract from the *Lick Observatory Bulletin* No. 79.